REPORT DOCUMENTATION PAGE

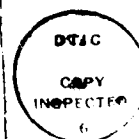Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	1 June 90	FINAL 1 Dec 88 to 30 Nov 89

4. TITLE AND SUBTITLE
MULTI-USER FACILITY FOR HIGH PERFORMANCE OPTICAL RECORDING
OF BRAIN ACTIVITY (DURIP)

5. FUNDING NUMBERS
G - AFOSR-89-0118
PE - 61102F
PR - 3842
TA - A4

6. AUTHOR(S)
Dr David M. Senseman

AD-A223 491

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Dr David Senseman
University of Texas at San Antonio
San Antonio, TX 78285

8. PERFORMING ORGANIZATION REPORT NUMBER

AFOSR-TR- 90 0683

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Dr William O Berry
AFOSR/NL
Building 410
Bolling AFB, DC 20332

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT

unlimited

DISTRIBUTION STATEMENT A
Approved for public release
Distribution Unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

This equipment grant provided funds to purchase a Silicon Graphics workstation for optical recording of brain activity. The system is being used by scientists at the University of Texas and the USAF School of Aerospace Medicien to examine brain electrical activity related to aerospace environmental stresses. Keywords

Purchases, Logistics, contracts, Guarantees, ...

computer Data

DTIC
ELECTE
JUN 27 1990
S D

14. SUBJECT TERMS			15. NUMBER OF PAGES
			16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
(U)	(U)	(U)	(U)

FINAL REPORT: AFOSR-89-0118

1. PROJECT TITLE: MULTI-USER FACILITY FOR HIGH PERFORMANCE OPTICAL RECORDING OF BRAIN ACTIVITY (DURIP)

2. GRANTEE: THE UNIVERSITY OF TEXAS AT SAN ANTONIO

3. PRINCIPAL INVESTIGATOR: DR DAVID M. SENSEMAN

4. ADMINISTRATIVE OFFICE: AFOSR/PKD, BUILDING 410 BOLLING AFB DC 20332

5. SPONSORING SCIENTIFIC OFFICE: AFOSR/NL, BUILDING 410, BOLLING AFB DC

6. PROGRAM MANAGER: WILLIAM O. BERRY

EQUIPMENT PURCHASED:

In the original proposal funds were requested to purchase a SUN Microsystems 4/260C color graphics workstation with a 60 MByte tape backup unit, 280 Mbyte SMD hard disk drive and a TAAC-1 image processor/graphics board. Total acquisition cost per unit (including a 30% University discount) for the SUN system was quoted at $44,823.

Following submission of this proposal to AFOSR, we continued to monitor new product offerings in the volatile workstation market by major systems vendors (i.e. Digital Equipment Corp (DEC), Hewlett-Packard, Pixar, SUN Microsystems and Silicon Graphics Inc). At the time the award made, we determined that the workstation system most suitable for our research needs was the Silicon Graphics Inc. (SGI) model 4D/50GT. This system has substantially better 3-D graphics resolution and performance than the SUN 4/260C workstation originally selected.

Details of the SGI 4D/50GT workstation purchased with the DURIP funds are as follows:

Silicon Graphics model 4D/50GT with:
> MIPS 32-bit Risc CPU (8 MHz)
> 8 MBytes memory
> 170 MByte hard disk (SCSI Interface)
> 60 MByte tape drive (SCSI Interface)
> 19" (dia) color graphics monitor (1280 x 1024 pixels)
> NTSC Genlock board
> Ethernet port
> IRIX (Unix System V) operating system
> Graphics Development software

AFOSR Funds (DURIP)	=	$ 45,000.00
UTSA Contribution	=	7,119.02
Total Acquistion Cost	=	$ 52,119.02

RESEARCH:

We have successfully completed our first task in the integration of the new workstation into our experimental system, i.e., the porting of existing software code to the SGI workstation for the display of our experimental data. The number of man hours to complete this task was estimated to be approximately 6 man months which is about the time it has taken to complete the initial port. We are quite please with our choice of the Silicon Graphics workstation over the offering from SUN Microsystems.

Attached (Fig.1) is a color photograph of three graphical user interfaces (GUI's) that we have developed to facilitate qualitative and quantitative analysis of our optically recorded brain electrical information. We decided that the additional effort needed to program these GUI's (compared to a simplier text-based menu selection scheme) would yield greater productivity and allow us to fully utilize (exploit?) the relatively large number of unskilled laborers (i.e. undergraduate students) available at this University.

Starting 1 JUN 90, we will formally begin a colaborative research effort with Dr. G. Andrew Mickley, Lt.Col., USAFSAM/RZP/536-3582 which will use optical recording techniques (and the SGI workstation) to study the functionality of neural connections between brain grafts and hippocampal tissue in rats with radiation-induced loss of granule cells. This work is being funded, in part, by the AFOSR RIP program with myself serving as a summer fellow.

We are still hopeful that we Dr. Michael Rea at Brooks AFB will be able to provide us will tissue samples so that we can use our optical recording techniques to study the spread of evoked electrical activity from the optical nerve into the suprachiasmatic nucleus and adjoining structures.

Final, we have made formal arrangements with Lt. Col. Robert M. Cartlege also at Brooks AFB (USAFSAM/RZV) to perform a pilot experiment to demonstrate the feasibility of using optical recording techniques to study information processing in the normal and laser-damaged mammalian (rabbit) retina. These initial experiments will carried-out in colaboration with Dr. Randy Glickman at the UT Health Science Center at San Antonio (UTHSCSA) would has extensive research experience with the isolated rabbit eye-cup preparation.

I have also enclosed copies of a research paper delivered this summer at a NATO Conference (Gottingen, FGR) and an abstract that has been submitted to the Society for Neuroscience. Two other research manuscripts are currently in preparation -- copies of these papers will be forwarded to your office as soon as they are accepted for publication.

Figure 1. Experimental Apparatus

Major functional subsystems of the experimental apparatus to be used in the proposed research are illustrated semi-diagramatically. Major equipment items used for multiple-site optical recording include a 464-element silicon photodiode array, and a 512-channel data acquisition system based on a Motorola VMEsystem 1147 supermicrocomputer system (25MHz MC68030 CPU, 8 MBytes RAM, 340 MByte SMD disk drive). For image *capture and processing,* a Hammamatsu C2400 video camera systems records a high-resolution (512 x 512 pixels), monochrome (8 bit) image of the preparation at the end of an experiment onto a Panasonic video disk recorder for archival storage. A VMEbus-based image processor (Imaging Technologies Series 150) is used to digitized and enhance the image between being written as a data file on the data acquisition system. Image and data files are transferred, in batch, over a 9600 baud line to a Silicon Graphics workstation (model 4D/80GT) for display and analysis using various display modes and options.

Figure 1

photodiode array

data acquisition system

brain

video camera

image processor

video disk recorder

graphics workstation
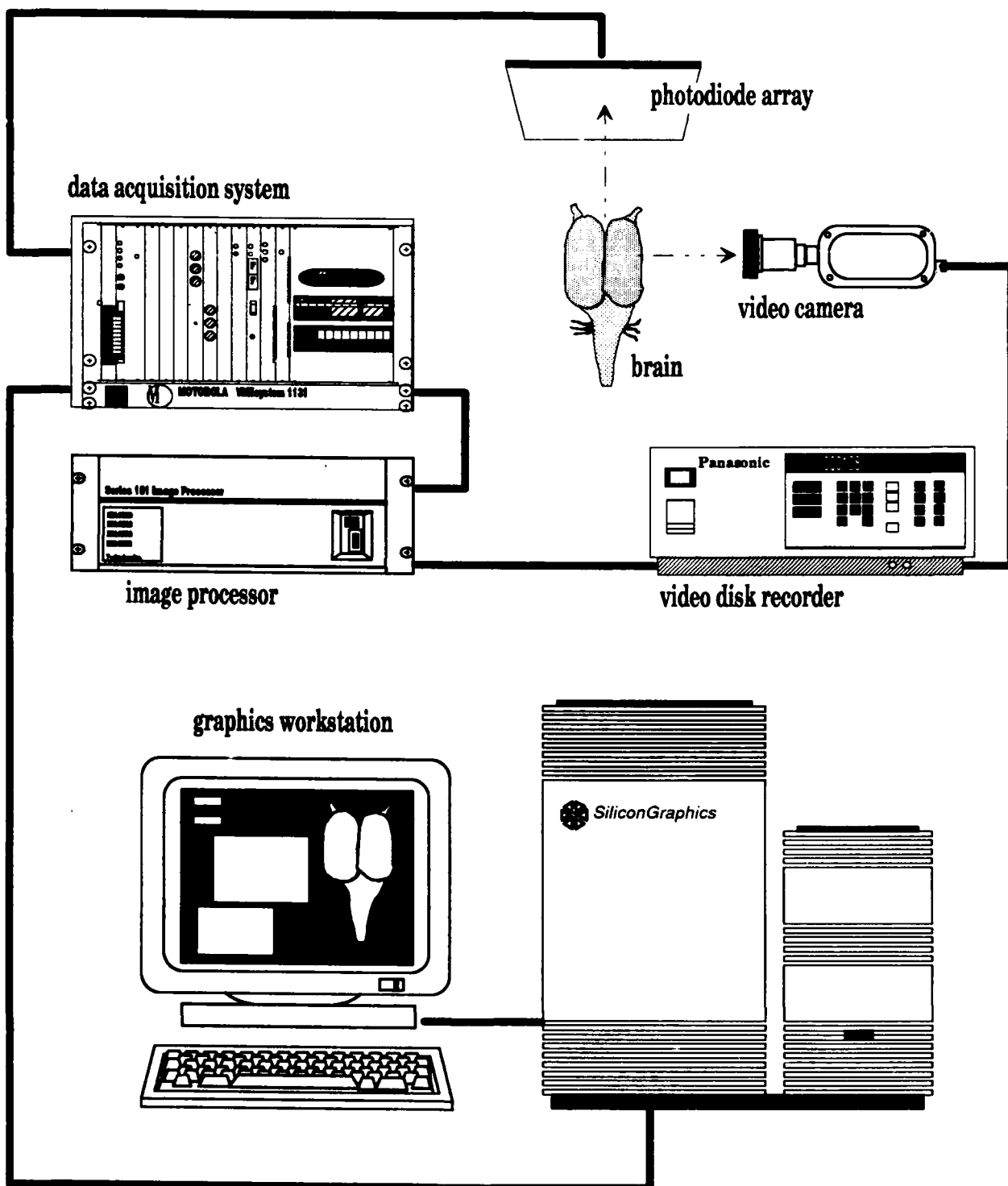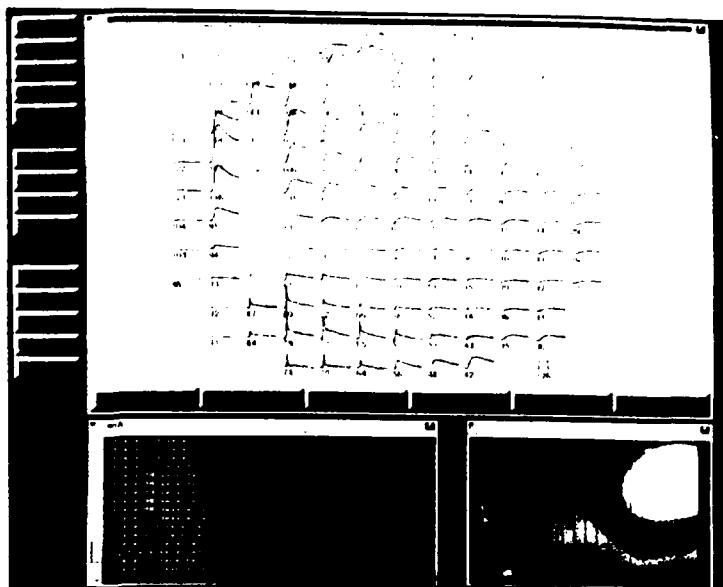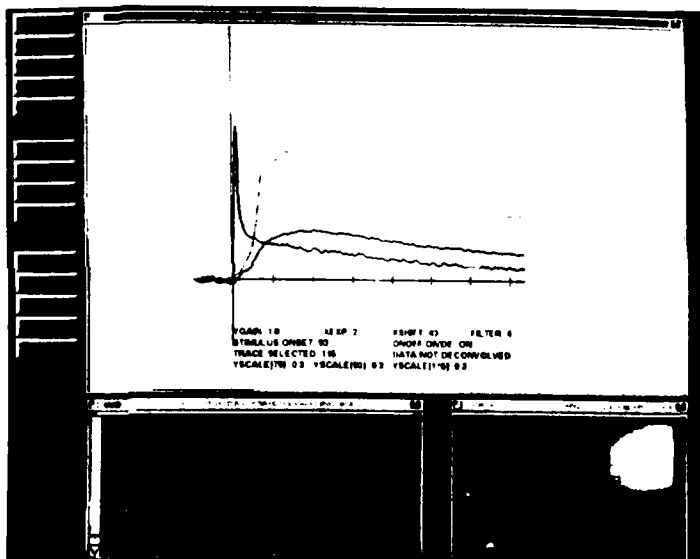
SiliconGraphics

Figure 3. Graphical User Interfaces (GUI's)

Color photographs taken directly of the screen of our Silicon Graphics workstation show the 3 main graphical user interfaces for data display and analysis. 'Radio buttons' at upper left of the screen can be 'pushed' by mouse-click to activate the different display modes (page display, examine, pam display) or manipulate diode array and image data files (e.g. read a new file, subtract one file form another, invert traces, etc.). The texport window at the lower left of the screen emulates an ASCII terminal which allows complex commands (e.g. file names) to be entered via the keyboard. Pop-up, roll-over menus, are used primarily to set various display 'flags' (e.g. norm/invert traces, figure/nonfigure mode). Three such menus are visible in the lower right corner of the large data window in the PAM display. An image of the preparation showing the recording locations of the various detector elements is present at all times during data analysis in the lower right window. In the examine mode, colored squares, matching the colored traces are used to mark the anatomical recording site of each selected trace.

PAGE DISPLAY

EXAMINE

PAM DISPLAY